



FIG. 1. Two large, adult male *Pituophis melanoleucus melanoleucus* engaged in combat, Ocean County, New Jersey, USA.

radio-telemetric studies (e.g., Zappalorti et al. 2015. *Herpetologica* 71:26–36). Additionally, combat and courtship behavior are rarely documented in *P. melanoleucus* (Beane 2012. *Herpetol. Rev.* 43:349–350).

At 1430 h on 01 May 2009 (20.5–23.8°C, overcast), Ocean Co., New Jersey we were notified by outdoor recreationists of two large snakes “mating” on an open trail. Upon our arrival, we observed two male *P. m. melanoleucus* engaged in ritualistic combat (Fig. 1). The two were entwined with each attempting to press the other’s head into the sandy substrate, while producing loud hisses characteristic of *Pituophis* spp. (Conant and Collins 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.). Despite our close proximity, the two were completely oblivious to our presence, and would have certainly made contact with our bodies had we not retreated out of their way. Both individuals were nearly equal in size (total length ca. 180 cm). While the two combatants continued, we searched nearby and discovered a female conspecific (total length ca. 160 cm). Presumably, this was the female over which the two males were combating. We left the males, which were still in active combat, after one hour of observation.

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RHABDOPHIS CONSPICILLATUS (Red-bellied Keelback). **MORPHOLOGY.** Nuchal glands are specialized defensive organs, first reported in a Japanese natricine snake, *Rhabdophis tigrinus* (Nakamura 1935. Mem. Coll. Sci. Kyoto Imper. Univ. Ser. B. 10:229–240). Similar organs were subsequently described by Smith (1938. Proc. Zool. Soc. Lond. Ser. B. 100:575–583) in nine additional natricine species from three genera, *Rhabdophis*, *Macropisthodon*, and *Balanophis*, which he collectively referred to as nucho-dorsal glands. More recent studies have demonstrated that the nuchal glands of *R. tigrinus* are associated with a defensive system characterized by unique morphological, developmental, physiological, and behavioral features, such as unusual ultrastructure of cells, mesodermal origin, presence of cardiotonic steroids, sequestration of dietary toxin, and associated peculiar antipredator displays (see Mori et al. 2012. *Chemoecology* 22:187–198 for review).

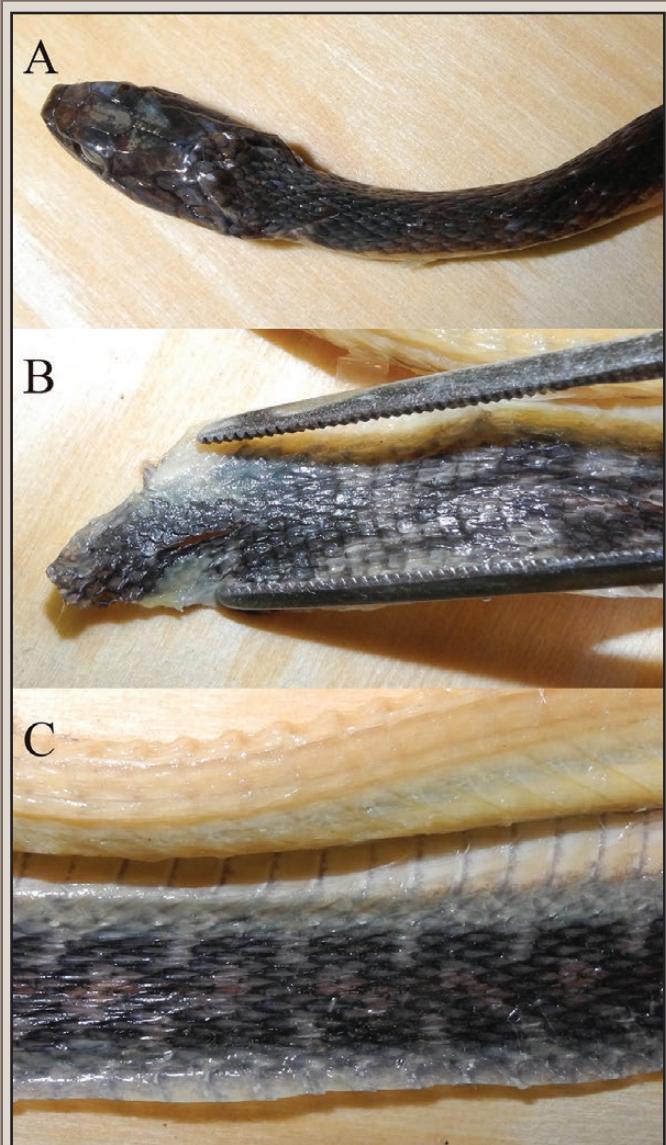


FIG. 1. A) Dorsal neck region of *Rhabdophis conspicillatus* (UNIMAS-SS-0084). B) Interior of the dorsal skin of the neck region of *R. conspicillatus*, showing lack of nuchal glands. C) Interior of the dorsal skin at the midbody of *R. conspicillatus*, showing lack of nucho-dorsal glands.

Mori et al. (2012, *op. cit.*) summarized the occurrence of these organs in snakes and listed 1) a total of 13 species in the above three genera as those that possess the glands, 2) one species of *Macropisthodon* and five species of *Rhabdophis* as those that do not have the glands (but see Mori et al. 2016. *Curr. Herpetol.* 35:53–58 for the discovery of these glands in *R. adleri*, which had been reported to possess no nuchal glands), and 3) six species of *Rhabdophis* as those that have no information on the glands. Here, we examined the occurrence of the nuchal glands of one of these species, *R. conspicillatus*, which is distributed over the Malay Peninsula, Borneo and adjacent islands of the western Sundas, including Brunei, Malaysia, and Indonesia.

Two preserved specimens (UNIMAS-SS-0084 and SS-0112) and one fresh specimen (UNIMAS-ID-9436) were examined at the museum of the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak. They were collected as road-kills in Sarawak, Malaysia (Sama Jaya Nature Reserve in

Kuching, Bukit Buan in Bidi, and Gunung Penrissen, respectively) between December 2013 and March 2014. We identified them as *R. conspicillatus* based on morphological characters diagnostic of the species as well as the characteristic white postocular stripe and incomplete white nuchal collar (Günther 1872. Proc. Zool. Soc. Lond. 40:586–600; Stuebing et al. 2014. A Field Guide to the Snakes of Borneo. 2nd Ed. Natural History Publications, Kota Kinabalu, Sabah. 310 pp.). We peeled the dorsal skin off of each specimen from the posterior edge of the parietal scales to the anterior region of the tail, using scissors and a surgical knife and carefully looked for any structure that resembled nuchal glands or nucho-dorsal glands, referring to drawings and photographs available in published articles (e.g., Smith, *op. cit.*; Mori et al. 2016, *op. cit.*). We carefully examined the interior side of the skin immediately posterior to the head to the point of cloaca, but we did not find any structure that looked like nuchal or nucho-dorsal glands in any of the three specimens (Fig. 1). These specimens, further, lacked the small, inconspicuous type of glands, reported in *R. adleri*. We, therefore, conclude that *R. conspicillatus* does not have nuchal glands.

Based on Mori et al. (2012, *op. cit.*) and the correction by Mori et al. (2016, *op. cit.*), this is the fifth species of *Rhabdophis* that has no nuchal glands, at least in some individuals. Confirmation of the presence/absence of the nuchal glands in the remaining *Rhabdophis* species, for which no information of the glands is available, is desired to advance our knowledge of the phylogeny of these snakes and the evolution of these unique defensive organs.

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RHADINAEA DECORATA (Elegant Leaf Litter Snake). **DEFENSIVE BEHAVIOR / DEATH FEIGNING.** Death feigning (thanatos) is an antipredator behavior that is widespread in animals (Toledo et al. 2011. Ethol. Ecol. Evol 23[1]:1–25). Although the behavior has been reviewed in snakes (Gehlbach 1970. Herpetologica 26:24–34), the prevalence of death feigning in these secretive animals has likely been underestimated. *Rhadinaea decorata* is a small diurnal snake that is widely distributed throughout forested regions of Central America (Savage 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. University of Chicago Press, Chicago, Illinois. 934 pp.). Although common in many areas, its behavior is not well studied (Savage, *op. cit.*). Herein we report an observation of death feigning in *R. decorata*.

We encountered a juvenile *R. decorata* (SVL ca. 12 cm) within the property of the Sea Turtle Conservancy, Tortuguero, Costa Rica (10.5472568°N, 83.5048544°W, WGS84; elev. 9 m), on 16 September 2012 at ca. 1300 h. The snake was crossing an artificial walkway in the middle of the property, approximately 25 m from the nearest source of cover. Immediately after handling began, the snake went into simulated convulsions, starting with the opening of its mouth (Fig. 1A), seizure-like contractions down

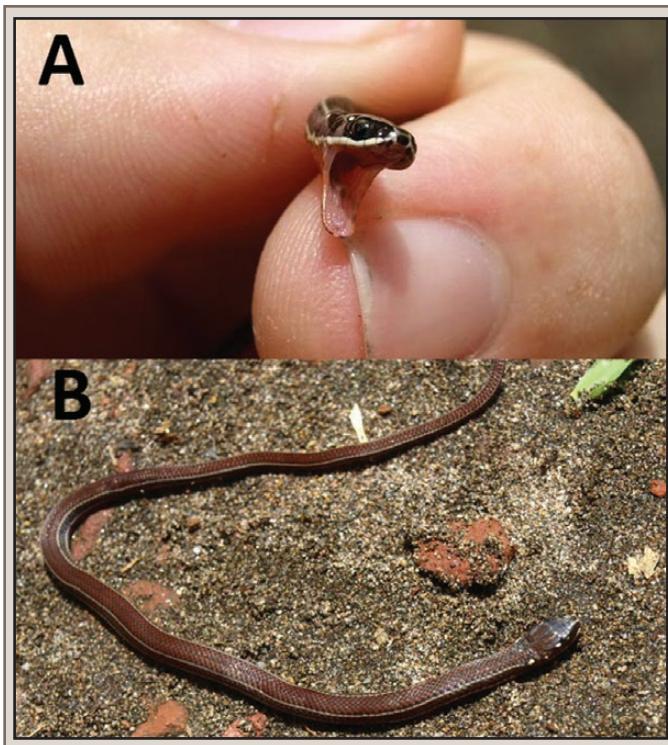


FIG. 1. A) *Rhadinaea decorata* initiating thanatosis behavior during handling. B) Immobile *R. decorata* at the culmination of thanatosis.

the length of its body, and release of musk, culminating with the animal flipping over to its back, before falling from the handler's grasp to the ground, and onto its belly (Fig. 1B). The animal then remained limp and motionless for several minutes, even when prodded. After being placed on top of leaf litter, the snake eventually returned to normal behavior and moved underneath the substrate. To our knowledge this is the first known observation of death feigning in this species. We thank J. Sean Doody for reviewing a draft of this note.

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SALVADORA GRAHAMIAE (Mountain Patch-nosed Snake). **WINTER FORAGING.** Little is known about the life history of *Salvadora grahamiae*, despite it being relatively common across its distribution in Arizona, New Mexico, Texas, and adjacent Mexico (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Press, Washington, D.C. 668 pp.). However, foraging behavior and diet composition have been reported on several occasions. From these accounts, *S. grahamiae* is described as a diurnal and active predator of primarily lizards, although small mammals, birds, smaller snakes, lizard, and snake eggs may be consumed occasionally (Tennant 1984. The Snakes of Texas. Texas Monthly Press, Austin. 561 pp.; Werler and Dixon 2000. Texas Snakes: Identification, Distribution, and Natural History. University of Texas Press, Austin. 437 pp.). We add to the knowledge of foraging behavior for this species by providing the first report of feeding during the winter period in far west Texas. For *S. grahamiae* and other snakes in the Chihuahuan Desert of west Texas, early November through early March is generally considered to be the inactive period (Werler and Dixon, *op. cit.*).